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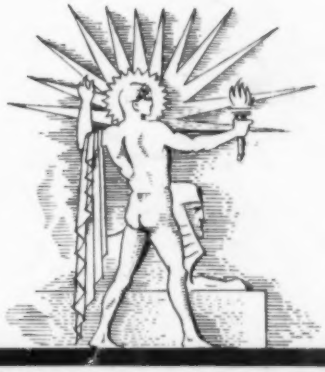
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



October 1, 1938

Group Treatment

See page 215

A SCIENCE SERVICE PUBLICATION

Do You Know?

Disturbing dreams can raise the sleeper's blood pressure.

According to legend, Alexander the Great had a statue made to show Persian women how to dress.

When the biggest ocean liners step up their speed, they use 50 per cent. more oil for every knot above 28.

Italy has built her largest power plant underground, beneath Mount Castello, where it will be safe from air raids.

The best French fried potatoes and potato chips are made from potatoes that have been stored at 60 degrees Fahrenheit.

Golf professionals recently tested their hitting power by aid of a phototube device, and the top swing was 81.1 miles per hour.

The famous Pharos of Alexandria, which guided shipping into the Nile Delta for 1,500 years, was lighted by a wood fire.

A falling meteorite is credited with ending a Central American revolution in 1906, when it struck and killed the revolt leader in his tent.

So small a sum as $144,000 worth of silver obtained from Greek mines enabled Greek Themistocles to build a fleet that routed the Persians at Salamis, thus shaping world history.

Eighteen species of insects are mentioned in the Bible.

The United States imports about 75 million pounds of silk a year, three-fourths of it coming from Japan.

The French Revolution did not introduce the guillotine as a beheading device; sixteenth century woodcuts show executions by instruments built on the guillotine principle.

One person in every 14 in this country last year spent some time in a hospital.

A new use for soap—in making cake—is reported by a soap manufacturing company.

Cornell University holds a brief school for missionaries each winter, to teach nutrition, farming, health, and other subjects that will enable them to help a community.

QUESTIONS DISCUSSED IN THIS ISSUE

Most articles which appear in SCIENCE NEWS LETTER *are based on communications to Science Service, or on papers before meetings. Where published sources are used they are referred to in the article.*

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CHEMISTRY

Castor Oil, Coal Newest "Silkworms" For Stockings

Patent on Synthetic Fiber Reveals It as Made From Substance Nature Creates in Death, Chemists from Coaltar

CASTOR OIL and coal appear potentially to be the "silkworm" from which may be made the silk stockings American women will wear tomorrow.

With these basic ingredients chemists are now fashioning, in their test tubes, a viscous fluid which can be drawn into fibers that are finer and stronger than natural silk and have amazing elasticity. While not yet ready for commercial production, chemists studying the new fibers aim at the goal of producing sheerer two-thread stockings that will have the durability of four-thread hose.

In the posthumous patent (No. 2,130,-948) of the brilliant du Pont chemist, Dr. Wallace Hume Carothers, recently granted by the U. S. Patent Office, is revealed this strange fiber that gives promise of being silk's crucial rival in the hosiery field.

For the past month du Pont officials have maintained a complete silence, in the face of many rumors, on the nature and properties of a new fiber which was superior to silk and potentially could battle silk for control of the hosiery field. News of this new fiber, without details, leaked into chemical circles.

In the new patent, fiber experts at the National Bureau of Standards believed they have discovered the long-awaited and very important announcement.

Finer Than Silk

Completely synthetic in their origin, the new fibers can be easily drawn to a size equal to the diameter of a natural silk filament, or in the extreme case, to only one-seventh the diameter. Yet the new fiber shows a tensile strength equal or better than that of silk. In some cases the fibers are 150 per cent. stronger than silk.

"The elastic recovery of these fibers under moderate elongations was very remarkable," states the patent, "and in this respect was much superior to existing artificial silks."

The fibers are "lustrous and silky in appearance" and are almost completely insensitive to moisture. When made into fabrics the synthetic fiber fabric possesses a far better elastic recovery than natural silk.

The Carothers patent, with 56 broad and basic claims, describes the production of fibers from long chain amine compounds. These are prepared by reacting diamines and dibasic acids. Out of this reaction come acid salts which are crystalline solids having fairly definite melting points.

Eight specific ways of creating the new fibers are described. A typical reaction is a mixture of 14.8 parts of pentamethylene-diamine, 29.3 parts of sebacic acid and 44 parts of mixed xylenols.

The new silk is not rayon, for its origin is not from the cellulose of growing plants like cotton or wood, but from coal and its highly important coal tar derivatives.

Coal tar has already produced thousands of organic compounds that range from perfumes which nature never knew, to explosives and dyes and even to organic compounds of the human body itself.

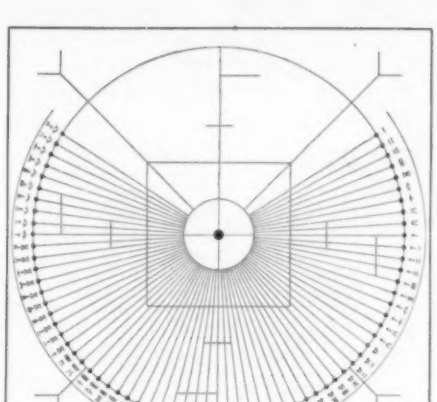
Products of Death

In fact, one of the ways to prepare the new synthetic silk fiber might be to make it out of a human corpse. A basic ingredient of the fiber is the chemical known as cadaverine that is formed in the human body after burial. Cadaverine is formed by nature as a decay product of the lysine which occurs in many of the body proteins, in serum albumin and in the fibrin of clotted blood. After death lysine breaks down and forms the evil-smelling and poisonous cadaverine. Cadaverine is known to chemists as pentamethylene-diamine.

But chemistry, with its ingenuity, does not need to depend on death for its supplies of this material. Out of sticky black tar, formed as coal is heated and its vapor caught by distillation, a long series of steps can duplicate cadaverine. It is by this completely synthetic method that Dr. Carothers prepared his material from which the silk-rivaling fibers come.

Castor oil enters into production of the new fiber because it is used to form an acid which reacts with the cadaverine. This is sebacic acid. To make it, chemists first make a castor oil soap (just as soaps are made out of palm oil and other vegetable oils). Heating this castor oil soap with sodium hydroxide creates sebacic acid.

A remarkable property of the new



ACCURATE

The sundial, of which this is a line drawing, was made about 2300 years ago at a time when the Chinese divided the day into 100 parts. The dial has an accuracy of one part in 2500.

ASTRONOMY

Ancient Chinese Sundial Found Extremely Accurate

ONE of the world's oldest sundials, unearthed in China and dating from the Han Dynasty, about the third century, B.C., impressed astronomers with its accuracy and precision of construction when Dr. Peter M. Millman of David Dunlap Observatory, Richmond Hill, Ont., analyzed it in a report to the American Astronomical Society.

Divided into 69 equal segments each 1/100 of a complete circle, there is a circle inscribed with an accuracy of one part in 2500. The Chinese were known to divide the day into 100 parts in that period. Other lines on the stone were used to determine the solstices. The dial was evidently placed in the plane of the equator and Dr. Millman considers it probable that it was a standard type made for use over a fairly wide range of latitudes.

The dial was brought from China by the Rt. Rev. W. C. White, and it is now in the University of Toronto's Royal Ontario Museum of Archaeology. It is the only one of its kind known in any collection at the present time.

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fibers is the ability to stretch them up to 700 per cent. and thus create permanently an almost complete alignment of the molecules of the material. Under X-ray study sharp diffraction images are obtained which denote a "true fiber."

The new fiber, says the patent, is an outstanding contribution because it is made entirely by synthetic means and has the unusual property of being very strong, flexible, elastic and insensitive to moisture to a high degree.

The excellent recovery of the fiber, after stretching, makes it "especially useful in the preparation of knitted wear, such as stockings, gloves, sweaters, underwear suits, etc." In the light of the fiber's rivalry with natural silk, it is significant that stockings are mentioned first in this list of applications of the fiber.

While extremely fine fibers can easily be drawn by the new process, it is also adapted for the production of larger filaments which are useful as bristles, artificial straw, fishline leaders, musical instrument strings, dental floss, horse hair and mohair substitutes and the like. The bristle filaments have "good snap, toughness and resistance to water." The du Pont Company has already announced a brush containing synthetic bristles which, it may be suspected, are made of the new fibers.

Can Deluster

Although the fibers have a luster like silk, it is easily possible to treat them and reduce or destroy this luster, states the patent. Zinc oxide and carbon black are among the best known of these delusterants.

Textile experts of the National Bureal of Standards believe that it will be some time before the new fiber will be on the market in its most important application, the hosiery field.

It is believed that the cost of materials used in the fiber's preparation will make it more costly than rayon. Whether it can compete with silk in cost, if large scale output is obtained, is a question for the future to decide.

The new patent's implications to a nation like Japan, producing the great bulk of the world's natural silk, are not to be overlooked. When and if the chemists decide to bring the new product out of the laboratory, America, with its vast supplies of coal, will be a step nearer freedom from foreign domination of its silk requirements.

Dr. Carothers' death on April 29, 1937, by suicide, came only 20 days after the application on his important fiber patent was filed. At only 41 years, his passing removed from the chemical stage a brilliant experimentalist who had played a leading role in producing du Pont's synthetic rubber, Neoprene, in 1931. Dr. F. B. Downing and Dr. Ira Williams were other chemists of the group who took Father Julius Nieuwland's original researches with acetylene derivatives and turned them into a product superior to natural rubber for many uses.

Dr. Carothers took his B. S. degree from Tarkio College in Missouri in 1920 and his M. S. and Ph.D. from the University of Illinois in 1921 and 1924 respectively. He was a member of leading scientific societies in America and abroad and in 1936 was elected to membership in the National Academy of Sciences, highest American scientific honor.

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RADIO

Obtain 2,500-Mile Reception On Television Wavelengths

Amateur Reports to Harvard Show Super-Reception on Night of June 5 Due to Behavior of Great E Layer

AMERICAN radio amateurs in 30 states have enabled Harvard scientists to learn new facts about the strange behavior of the electrified "E" layer some 74 miles above the earth.

Transmission on the ultra-high frequency band of 56 to 60 megacycles—a band contemplated for television transmission—has been found to have amazingly long pickup; 2,500 miles in an extreme case.

Over 700 contacts between amateurs on this band on the single night of last June 5 show receptions of these supposed line-of-sight frequencies over distances of 600 miles in many cases. And in exceptional cases reception was obtained over distances of over 1,400 miles, report J. A. Pierce and H. R. Mimno of Cruft Laboratory, Harvard University (*Physical Review,* Sept. 15).

Working with amateur contacts assembled by the American Radio Relay League, amateur radio's coordinating organization, the Harvard scientists have used the data thus gathered from hundreds of "ham" operators to discover that two happenings on June 5 led to the amazing distance, or DX, reception.

They found that high over the eastern United States on this date there was a remarkable coincidence of great E layer ionization with unusual atmospheric bending of the transmission paths a mile or two above the earth. This giant bending area, roughly oval in shape, stretched in an east-west direction from Providence, R. I. to Akron, O., and north-south from Rochester, N. Y., to Gettysburg, Pa. It was this condition which accounted, they believe, for reception up to 300 miles.

The much greater DX reception, reaching up to 1,400 miles in one case, is explained by direct reflection off the E layer. This distance, the Harvard scientists point out, is the maximum which can be secured with a single reflection off this layer.

Still later reports to Science Service show evidence of a double reflection off the E layer and a total transmission distance of 2,500 miles.

The 56 megacycle (56,000,000 cycles a second) band on which these observations were obtained has recently been opened to amateur transmission by the Federal Communications Commission. For many years it has been regarded as a strictly local band of communication for the signals appeared to travel pretty much in line-of-sight and were often blocked out by obstacles and by the horizon.

Parts of this and neighboring bands have been assigned for television transmission and it has been one problem of television to get around, in some fashion, the restricting local characteristics of signals on these frequencies.

Admittedly the night of last June 5 represented a most unusual case of radio transmission for the eastern United States but it represents a condition which might occur again. Perhaps when television comes into regular operation in the homes of the future you may suddenly find your images double. One from your nearby local television station and another from a station operating some 1,000 miles away. You may be seeing double but, in this case, it won't be your own fault.

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ECONOMICS

In Sudeten, Germany Would Add to Raw Material Needs

Disputed Section Holds Important Industrial Plants But Depends for Food on Other Parts of Czech Nation

NAZI GERMANY, by incorporating within her borders the Sudeten area of Czechoslovakia, would add to her industrial plant heavy Sudeten industries of stragetic importance but would at the same time render more acute her need for food and raw material imports, information supplied by the Bureau of Foreign and Domestic Commerce indicated.

Principal prize would be the world-renowned Skoda munitions works, providing they are not dismantled or destroyed by angered Czechs before the territory is finally surrendered.

The Sudeten area is also noted as one of the important European textile centers. Other manufactures include a wide variety of light consumers' goods such as toys, novelties, imitation jewelry, glassware and porcelain.

The famous Czech shoe industry is not centered in the Sudeten area.

But since no raw materials to speak of are produced in this mountainous area, Germany would have to make additional imports or produce additional "ersatz" materials in order to keep the busy Sudeten factories running.

Further, the market for many of these products might be cut. For example, the anti-Nazi boycott in the United States, which has reached effective proportions, would doubtless be extended to include Nazi Sudeten products. Instead of the label, "Made in Czechoslovakia" they would have to bear the marking "Made in Germany."

Food for the four million inhabitants of the region is imported from nearby agricultural areas of Czechoslovakia, as not enough food for the four million is grown in Sudetenland. But with the Sudeten area made German an economic barrier would separate the Sudetens from their food supply.

A similar situation holds with regard to raw materials for the great Skoda works. Some iron is produced in Czechoslovakia, but that comes from the Slovakan districts.

Annexation of Sudetenland therefore recalls German "anschluss" with Austria six months ago, when the Reich added within her borders a country that was an important industrial nation but was dependent upon the outside world for food supplies. Since provision of such foods as fats has been a pressing German problem for several years, and self-sufficiency in other food-stuffs has been attainable only with extreme difficulty, Nazi worries in this respect are increased.

Most of the textile plants in the Sudeten area are for making real, not synthetic fibers. Hence they are even now dependent upon foreign sources for raw materials such as cotton and wool. Nazi economists working under General Goering, administrator of Germany's economy, may expect difficulty in providing these plants with the necessary raw-stuffs. Foreign exchange for purchasing these supplies has until now not been a serious problem for the Czechs who have found a ready market for their goods. But it is a serious matter to Nazi Germany.

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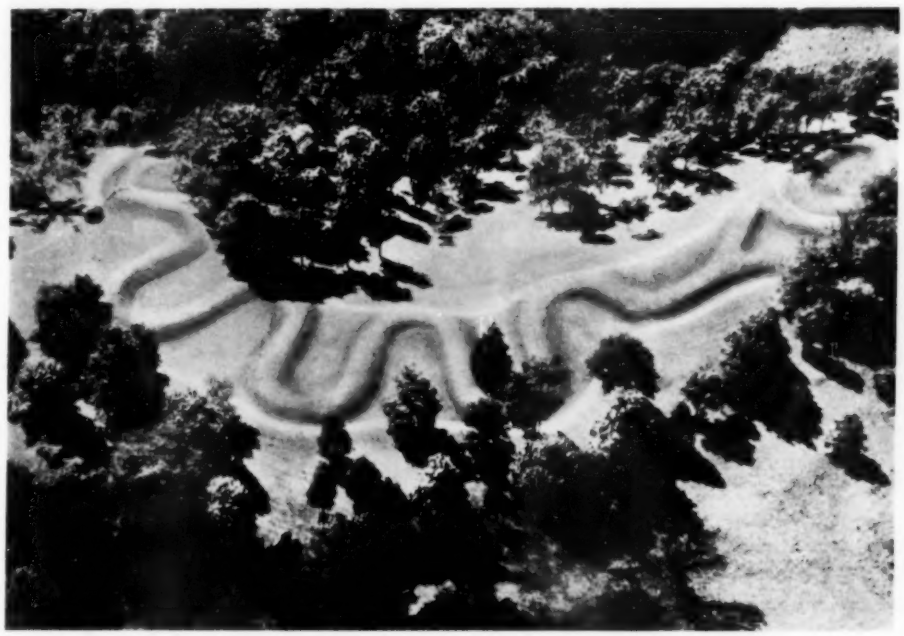

GREAT SERPENT MOUND

An air view of this archaeological site now available to tourists.

ARCHAEOLOGY

Ancient American Wonder Gains Tourist Fame

AMERICANS are discovering one of the wonders of ancient America—the Great Serpent Mound in southern Ohio.

The mound is not new to archaeologists, nor to a good many other people, especially mid-westerners. But visiting it has been made "convenient and pleasant" by aid of an $80,000 WPA and Ohio State project, and discovery on a large scale has begun. Some 100,000 roving Americans this summer have taken in the earthen curiosity, which one archaeologist informally calls "a good old antique." From now on, the Great Serpent is expected to become a standard sight.

The first white man who discovered the mound did not find it particularly convenient or pleasant. Who he was, nobody seems to know any longer. But word got around his neighborhood that over in the woods by the river was a queer winding bank of earth, probably something wild Indians built for defense.

Then came the archaeological team of Squier and Davis, studying Indian remains. One good look told them what the earthwork represented. It was a snake symbol, cleverly modeled in raised earth to wind along the high cliff by the river. Dimensions of the creature call for Hollywoodian adjectives. It is four

or five feet high, and its coils are 1,254 feet long. The open jaws are 61 and 56 feet respectively in length, and in their 75-foot gap lies an oval mound of earth like a big egg about to be swallowed. The egg was probably an altar, for on it the Indians left burnt stones.

Mound building Indians of the midwest built a good many effigies resembling men, birds and beasts. But the Great Serpent is a prehistoric masterpiece.

Ever since 1886, when Harvard University's president was dismayed to find a cornfield waving among the Serpent's coils, the earthen monument has been protected, restored. The Ohio State Archaeological and Historical Society has owned the land since 1900.

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PUBLIC HEALTH

Thousands Amid Food Plenty Suffer From Malnutrition

THERE ARE thousands of Americans who live in a land of food plenty and yet suffer from hunger. This is not a story about economics and how badly we distribute our agricultural products. It is a story of hidden hunger, the diseases of malnutrition. It is an ABC story because it is about vitamins.

The best estimates or guesses as to the prevalence of nutrition diseases can not be backed up by figures because, except for pellagra in some southern states, the deficiency diseases are not reportable. Yet people die of them.

Prize medical story in this regard comes from one of the largest of New England cities. A woman was found dead at the bottom of a staircase in a not-too-well-off residence. She was covered with what appeared to be livid bruises. Naturally the husband was taken into custody by the police. He might have been tried for murder, except that a keen-eyed coroner-physician, performing the autopsy, rendered a verdict that set him free. The woman had died of acute scurvy, the symptoms of which made her appear to have been badly beaten. Scurvy is caused by a lack of vitamin C contained typically in citrus fruits.

Lack of vitamin A causes a form of night blindness, sometimes involved in auto accidents. This vitamin is contained in butter. When during the World War, no butter was available and skim milk was used widely in some Scandinavia areas because butter could be sold at such high prices, eyes of some children were permanently injured.

Rickets is widely found in rich and poor children alike, despite all the cod-liver oil and vitamin D extracts sold and administered.

All the pellagrins, those who do not get the P-P factor that prevents pellagra, are not in the southern states. It is found in northern areas and large cities where lack of money, alcoholism, or idiosyncrasies of diet prevent eating proper protective food.

Beri-beri is occasionally found in America. Its cause, which is lack of vitamin B one, is also blamed for neuritis frequently associated with other diseases in this country.

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ASTRONOMY

New Exploding Star Theory Traces Evolution of Growth

Stars Grow Old by Getting Hotter and Brighter Then Contracting; At Turning Point They May Flare

A NEW theory of evolution for "exploding" stars called novae by astronomers, is suggested by Prof. George Gamow, of George Washington University (*Physical Review*, Sept. 15).

Stars grow old, Prof. Gamow's hypothesis suggests, by gradually burning up their hydrogen and getting hotter and brighter. A source of nuclear energy within the star causes this first stage.

Next point in the star's evolution is a progressive contraction in which the star's radiation comes from gravitational energy only. However, at the turning point between hydrogen-burning and the gravitation contraction, the star's mass must redistribute itself.

During this redistribution of mass, gravitational energy is liberated which shows up, suggests Prof. Gamow, as a short-time additional brightness. It is this brightness, he adds, which may well be the cause of the bright flare-up of the so-called "nova" stars.

What happens to the star, after contraction sets in, depends on its mass when the contraction starts. For small stars less than 3.2 times as large as the sun the contraction leads to the well-known type known as the white dwarfs which have "a degenerated electron gas inside and very small energy production."

For the larger stars, however, the contraction creates a central neutron core inside the star which represents "a practically unlimited source of energy." The growth of such a neutron core will bring about an increase in the amount of energy liberated and probably makes the star's atmosphere expand. In this state it may enter the star class known as the giants.

Finally the explosion of such giant stars will lead to extremely bright novae which might be identified as the supernovae; a class suggested by Prof. Fritz Zwicky of the California Institute of Technology and Dr. Walter Baade of Mt. Wilson Observatory.

Astronomers could check the new hypothesis, Prof. Gamow suggests, by seeing if the spectrum of the star known as Nova Corona belongs to the M giant class of stars.

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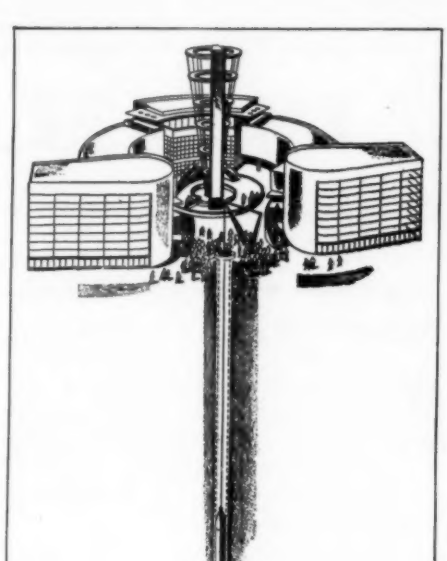
FOR FUTURE EYES

This lady's hat in the mode of 1938 is designed to excite comment fifty centuries from now when the time capsule is excavated by archaeologists of that day. It is one of a number of articles in common use included in this "cross-section of civilization" which also contained more than 10,000,000 words and a thousand pictures on microfilm.



BURIED TREASURE

Books deposited in libraries will guide archaeologists to this spot—latitude 40 degrees, 44 minutes, 34.089 seconds north; longitude 73 degrees, 50 minutes, 43.842 seconds west—where lies buried a glimpse of 1938 civilization.

GENERAL SCIENCE

Condemns "Despotism" In "Time Capsule" Message

FUTURE citizens of the world, 5,000 years from now, even though they may not know despots of the twentieth century variety in the flesh, will have at least a denunciation of them from the lips of one famous American, Dr. Robert Andrews Millikan, Nobel prize-winning physicist of the California Institute of Technology.

"If the reactionary principles of despotism triumph now and in the future, the future history of mankind will repeat the sad story of war and oppression as in the past," Dr. Millikan declared in a message prepared for inclusion in the "time capsule" the Westinghouse Electric and Manufacturing Company buried (Sept. 23) beneath its exhibit site at the New York World Fair.

Accompanied by messages written by Prof. Albert Einstein and Dr. Thomas Mann, widely-known German novelist now in exile in the United States from his native Germany, Dr. Millikan's message was included in the "time capsule" with objects and photographs depicting life today. Books scattered in libraries throughout the world will instruct archaeologists to dig it up in the year 6939.

"At this moment, August 22, 1938, the principles of representative ballot government . . . are in deadly conflict with the principles of despotism," Dr. Millikan wrote.

Hope for a more cheerful future was expressed by Prof. Einstein and Dr. Mann.

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ARCHAEOLOGY

Foresees Our Civilization Rated Barbaric by Future

Archaeologist Believes Clay Records of Babylonians Will Give Later Scientists More Favorable Picture

MODERN civilization has been trembling on the brink of world-shattering war, but we scarcely think of ourselves as wiped out of history, while the story of Babylonia goes on forever.

Yet, this possibility is foreseen in a book just published, "They Wrote on Clay," which Prof. Edward Chiera, University of Chicago Assyriologist, left unfinished at death and which has been completed by his associate, George G. Cameron.

Scholars of the future will probably decide, the book concludes, "that the 'golden age' of mankind was in the second and third milleniums B.C., after which barbarians took command and messed things up so thoroughly with their machines and mechanical inventions that they finally brought civilization to crash on their own heads."

The Babylonians will outlast us in history, the book foresees, because they wrote everything on durable clay, whereas our literature, history and vaunted progress are entrusted mostly to flimsy paper.

Archaeologists believe 99 per cent. of Babylonian writings are still buried in the Near East. But thousands of documents have been found and read, revealing a civilization which has been forgotten, but not lost.

Assyrians and Babylonians were never defeated, to hear them tell it on clay—exactly like modern dictators who can twist defeats to sound like victories. History writing has not changed in thousands of years, says Prof. Chiera.

Babylonian law in 2000 B.C. required every business deal put in writing, signed and witnessed. It is only in recent centuries that we have required certain contracts to be in writing to prevent fraud.

Babylonians and even Sumerians before them anticipated Darwin's theory of evolution. They had no scientific way of investigating man's past, but in a myth they traced life back to a time when man ate grass, wore no clothes and apparently walked on all fours.

Babylonians could not "raise checks" or forge changes in documents. Their clay "papers" were enclosed in clay envelopes, on which the data were copied, and the cleverest crook could not open the envelope without breaking it. Modern archaeologists have tried opening those envelopes.

Babylonians had office files, and even had office girls, but the latter were not much of a success.

Babylonian literature is making the Bible understandable. Prof. Chiera's book says that the Bible tells too little about life and customs of its time to give us a complete picture. Many of our interpretations of obscure passages are handed to us by theologians of the Middle Ages, who knew nothing about oriental ideas and little about the languages. Prof. Chiera says closer study of cuneiform literature will play havoc with some of these interpretations, and the Bible will again give the message its writers intended to convey.

Science News Letter, October 1, 1938

MEDICINE

Four-At-Time Iron Lung Saves Expense; Now in Use

See Front Cover

MASS production hasn't come to the healing profession, but doctors have found that a single pressure and breathing rate will do for a wide range of persons. So they fixed up a four-at-a-time respirator, now in use at the Children's Hospital in Boston. Naturally, it costs less per patient than the expensive single iron lung and the patients also have company.

This multiple treating device is shown on the front cover.

Science News Letter, October 1, 1938

PUBLIC HEALTH

Whooping Cough a Record Year-Round Disease

WHOOPING cough has set an "amazing" record during the past eleven months, officials of the U. S. Public Health Service find.

This serious childhood malady was added to the federal health service's list of "reportable" diseases for the first time last October. The chart showing the number of cases throughout the nation each week since then has a horizontal, almost straight line, instead of the curving lines such as appear on the charts for each of the other diseases on which state health officers report each week. The whooping cough line is at about the 3,000-case per week level.

Whooping cough thus turns out to be a year-round disease, the only one of its kind among the whole group, which includes smallpox, diphtheria, influenza, and infantile paralysis. This means that throughout the nation just about the same number of children are whooping every week in the year.

Because whooping cough is especially likely to be fatal to infants and small children, the U. S. Public Health Service advises keeping all children under five years of age at home by themselves if there is whooping cough in the vicinity.

The federal health service seems rather lukewarm about the various whooping cough vaccines available. The results are not 100 per cent., but there is a chance they might do some good, sums up the service's advice on this subject.

Science News Letter, October 1, 1938

PHYSIOLOGY

Things That Make You Tired Besides Work

FATIGUE is defined as weariness from over-exertion but many a time a person feels weary when he wakes in the morning after a night's rest. At least five things or conditions can make you feel weary besides hard work.

One of these, according to Dr. F. L. Meredith, professor of hygiene at Tufts College, is the presence in the body of poisons other than those of fatigue. Such poisons are those produced by bacteria. You know how tired you feel when you are "coming down" with a bad cold or some other germ-caused illness.

Chemical disorders other than those due to excessive fatigue may make you feel very weary. For example, if you are anemic, your body chemistry is upset by lack of iron and you feel tired all the time.

Cell changes other than those due to excessive fatigue following work may make you feel tired. Failure to eat enough vitamins, minerals or protein foods may cause a semi-starvation of the body cells which in turn causes changes in their condition that you feel as fatigue.

If your blood circulates slowly you may feel weary because the body cells are not quickly equipped for action and respond in the same sluggish fashion as when they have worked and are tired.

Your weariness may be due to a state of mind, rather than to work. Being worried or simply bored may make you feel tired. On this point Dr. Meredith says:

"Those who are not interested in what they are doing, or are troubled by anxiety and fears of various sorts, are prone to note signs of fatigue too readily, and to interpret their lack of zeal for work as lack of fitness for work."

Fun, excitement and competition, on the other hand, not only keep you from noticing fatigue but may even keep fatigue poisons from accumulating rapidly.

Science News Letter, October 1, 1938

PHYSIOLOGY—CHEMISTRY

Young Brains More Nimble Chemically Than Adults'

YOUNG brains are more nimble chemically than adult brains, it appears from studies with phosphorus made radioactive in the atom-smashing cyclotron of the University of California. The studies were made by Dr. I. L. Chaikoff, assistant professor of physiology in the university.

The rate of turnover of phospholipids or fatty substances in the young brain, Dr. Chaikoff found, is twice that of the adult, indicating twice the activity of the young brain, in this respect at least.

Nutritional conditions, he also found, do not affect the brain as much as other organs. The fasted brain showed as much phospholipid activity as the well-nourished brain, in adults particularly.

Whether the rate of chemical activity in the brain found in these studies is related to mental activity cannot be told yet. Dr. Chaikoff would draw no conclusions on this point. However, investigations of the relationship of such metabolic change to numerous conditions affecting mentality and brain function are to be continued.

Science News Letter, October 1, 1938

IN SCIENC

ARCHAEOLOGY

Big Town of Basket-Makers Unearthed in Colorado

RUINS of the biggest village of prehistoric Basket-Maker Indians yet found in Colorado are being unearthed by a Field Museum expedition, says a report just received from Dr. Paul Martin, in charge of the digging.

The settlement occupied by several hundred Indians over 1,300 years ago is so nearly invisible that a layman could walk among the trees grown over the site and never suspect that a thriving community once lived there. Nothing is left of post-walled, one-story houses but the holes where the posts were driven and the dirt floors of different color and hardness from the earth that has filled in above them. The dirt floors and walls of sunken pit houses can be cleared of surrounding earth by expert troweling. Artifacts of great antiquity used in the village are being found daily in the houses and granaries.

Age of the village, estimated at 600 A. D., will be more precisely determined by the aid of tree rings in ancient roof logs.

Science News Letter, October 1, 1938

CHEMISTRY

Explosion Danger Lurks In School Wells

DANGER of disastrous explosion lurks in wells attached to schoolhouses in certain coal-producing parts of the United States, such as Illinois, the U. S. Bureau of Mines warns in a recently issued circular. The danger comes from the presence of methane or "firedamp" dissolved in the water. Coming out of solution and mixing with the oxygen of the air, the gas awaits only a spark to set it off.

However, even if methane is discovered in the water, a well need not therefore be abandoned. The water is still good to drink, and the gas can be removed by flowing the water in thin sheets over baffle plates or otherwise aerating it before storing it in tanks or other closed reservoirs.

Science News Letter, October 1, 1938

ICE FIELDS

MEDICINE

Horse Encephalitis Vaccine Made of 5-Year-Old Germs

A VACCINE that is effective against horse encephalomyelitis, Western type, has been made from germs (virus) of the disease obtained from an animal that died of the disease five years ago, Drs. C. E. Beck and Ralph W. G. Wyckoff of the Lederle Laboratories report. (*Science,* Sept. 16).

This means that veterinarians fighting the horse ailment now epidemic in several mid-western States and Canada can use vaccine prepared from old strains of the causative virus and need not depend on virus obtained in the present epidemic for their vaccine.

The discovery was made in the course of studies of the stability and other characteristics of the virus that causes the horse ailment. The virus of the western type is entirely different from that of the eastern type of the disease and immunity to the one does not protect against the other.

Science News Letter, October 1, 1938

PSYCHOLOGY

Urges Psychology Course For Beauty Specialists

MAYBE YOU think of a woman psychologist as a spectacled spinster of uncertain age. They are not like that. Most of them are young women and some are extremely good looking.

A group of these pretty girls attending a recent psychology meeting were engaged in one of those "bull sessions" that are such a profitable part of all scientific gatherings. They were talking about psychology in the beauty parlor.

One, an outstanding beauty of the Irish type, was saying that all beauty parlor technicians should take a course in applied psychology.

Many states and cities now have strict regulations for beauty parlors. Girls learning to marcel and give facials are also struggling with *materia medica.* They must go to school and take special courses so that deft fingers will be accompanied by trained minds.

But, the beautiful woman psychologist protested, beauty is more than skin deep. Women go to a beauty parlor for more than creams and ointments. They want to be soothed by conversation as well as massage.

Of what use is a wrinkle-removing treatment if accompanied by tactless reference to increasing gray hairs? What good does it do to build a person's morale by flattering rouges and soft hairdresses if such ministrations are conducted to the tune of personal troubles or irritable remarks? Gentle massage on tired nerves can work magic, but the work may be undone by a display of impatience in the operator.

So let the beautician study what goes on inside the head on which she works. Let her discover how she can relax a frown and add sparkle to the eyes, by giving her customers peace of mind and mental uplift as well as masks and lotions.

Science News Letter, October 1, 1938

AGRICULTURE

Committee Urges Caution In "Dirtless Farming"

"DON'T plunge," might summarize the counsel given by the Committee on the Relation of Electricity to Agriculture on the subject of "dirtless farming"—the raising of vegetables and flowers in trays or tanks of fertilizer salt solution.

Recognizing that the tank culture technique may have a definite place "in the growing of special high-priced crops, particularly out of season in greenhouses, in localities where good soil is not available, or where it is found too expensive to maintain highly favorable soil conditions," the Committee nevertheless strongly advises interested possible investigators against being rushed off their feet by glowing accounts that may be used by promoters.

Profs. D. R. Hoagland and D. I. Arnon of the University of California, who made the survey for the Committee, suggest: "Those who contemplate installation of the water-culture method for commercial purposes should make a preliminary test with a few tanks of solution to compare yields from soil and water-culture media and to learn some of the requirements for control of the process. Without expert supervision, commercial success is unlikely."

The two California scientists also warn against "highly misleading claims" made by certain purveyors for small packages of nutrient salts now available to amateurs who may contemplate experiments with the "dirtless farming" method.

Science News Letter, October 1, 1938

GENETICS

Evening Primrose Mutant Displaces Former Variety

SOMETHING quite new under the scientific sun has appeared among the thousands of evening primrose plants cultivated by Prof. George H. Shull, Princeton's well-known researcher in genetics. In simplest terms, a new variety has cropped up where an old one used to be, and the old one has utterly vanished before it.

One kind of evening primrose in Prof. Shull's breeding stocks, when inbred or "selfed" with its own pollen, regularly produced a progeny two-thirds of which were plants like their parents, while one-third were so different as to rate a separate name for themselves.

During the present season the parent strain has suddenly dropped the old one-third of variants among its offspring, and in their place produces a like proportion of mutant plants of an entirely different type.

This is the first published instance of anything of the kind occurring in plant genetics; although Prof. Shull informed Science Service that twice before he has observed a like shift in the progeny of "selfed" evening primroses. These cases were not reported publicly.

No immediate application of the discovery in the breeding of economic plants is anticipated.

Science News Letter, October 1, 1938

ARCHAEOLOGY

Ancient Mammoth Hunters Trailed In Texas

BONES of a mammoth killed by Americans "of considerable antiquity," and an unusual type of stone weapon used in the slaying, have come to light in Texas, 30 miles from Abilene, Cyrus Ray of Abilene, Tex., and Prof. Kirk Bryan of Harvard University, report (*Science,* Sept. 16.)

The stone point adds to information regarding America's mysterious oldest inhabitants, generally believed to have lived over 10,000 years ago. The point is described as smaller and differing somewhat from the standard Folsom point of the ancient hunters, which came to light at Folsom, N. M. Calling the stone weapon Folsomoid, the report says:

"It is distinctly different from most of the points found with bison at either the original Folsom locality or at the Lindenmeier site."

Science News Letter, October 1, 1938

PHYSICS

Seeing the Invisible

A New Super-Microscope Achieves the "Impossible" And So Opens Vast New Fields to Eyes of Scientists

By RONALD L. IVES

THEY PROVED it couldn't be done —by mathematics of the most complicated sort—but Dr. L. C. Graton, Harvard's superskilled microscope expert, went ahead and did it anyhow. To a scientist of his attainments, the word "impossible" is a challenge, not a stop sign.

It all started a generation ago, when Dr. Ernst Abbé, Zeiss microscope expert, set 1500 diameters as the limit of magnification. Now, Dr. Graton, using equipment of his own design, claims magnifications of 6,000 diameters, and sees no theoretical limit to further magnification. When better lenses are ground, Dr. Graton believes, even greater magnifications will be possible.

Some idea of the old theoretical limit of magnification and the new working magnification can be gained by comparing it with photographic enlargement. Using a miniature camera negative, which is about 1 inch by 1½ inches, Abbé's law stated that magnifications equivalent to clear, sharp enlargements up to 125 by 187 feet were possible (we won't go into the problem of film grain here), while Dr. Graton actually gets magnifications equivalent to a print 500 by 750 feet! This is roughly equivalent to enlarging an air mail stamp to eight acres. By the old theory, it could only be enlarged to half an acre.

Sturdy

Dr. Graton's new wonder-microscope, designed in cooperation with Dr. E. B. Dane, Jr., also of Harvard, doesn't even resemble a standard laboratory instrument. With every minor vibration magnified 6,000 times, the slight and negligible play in the frame of a standard microscope would put the image completely out of sight, or bring in another, unwanted, image.

Built on a bed of steel rails, as strong as a screw-cutting lathe, and mounted on a concrete floor, the new instrument is just about vibration-proof. True, nearby blasting or an earthquake might jiggle it, but neither blasting nor earthquake is frequent in Cambridge.

Did you ever try to get a perfect focus with a microscope? Even with the fine adjustments supplied by the maker, focussing is a finger-straining, nerve-jangling job. Aware of this difficulty, from his long years of experience with microscopes, Dr. Graton designed a motor-driven adjuster so sensitive that it will, in a few seconds, shift the lenses into exact focus, without any wear and tear on the microscopist's fingers. The operator just presses a button to bring the lens nearer to or farther from the work.

By shifting gears, he can change the motion of the lens from fast to slow and back again. "Throw it into second compound and back off another millionth," may not be said in Dr. Graton's laboratory, but that's about how they adjust their instrument. So sensitive is this adjusting mechanism that it would take a fast man, turning the controls by hand, seven minutes to move the lens 1/100 of an inch. This is about the thickness of a sheet of paper.

Making Discoveries

Constructed with the ruggedness of a locomotive and the accuracy of a fine watch, the instrument is one of the finest pieces of machinery ever built. It has to be, with every error magnified 6,000 times.

Already, with the new magnifications, Dr. Graton and his colleagues are making discoveries which may push the horizon of the visible back still farther. So valuable was the new instrument in ore analyses that a duplicate, somewhat improved in design, was immediately ordered by the Canadian Department of Mines, and is now in use solving some of the puzzles of Canada's rich and complicated mineral deposits.

Special methods of polishing the fragments of rock for inspection under the new microscope had to be devised. Naturally, if the rock is badly scratched, the scratches will mess up the image seen or photographed through the microscope, just as cat-scratches on your face would make your portrait look pretty terrible

Until recently, rock samples were polished on cloth, with jeweler's rouge (not the kind your wife buys, but a redder, harsher kind that doesn't cost so much). Now, sheets of soft lead are used in place of cloth, and flatter, scratchless surfaces can now be made.

From his experiments, Dr. Graton has decided that the limits of magnification are not in the lenses at all, but in the surface being photographed.

With most camera lenses, you can take a picture of a man from a distance of ten feet and have his ears and his nose in equally sharp focus. This is called "depth of focus." As the lenses become larger, letting in more light, this depth of focus becomes less, until with very fast lenses, the image of a man's nose will be sharp, while his ears will be so far out of focus as to look fuzzy.

Little Depth of Focus

Dr. Graton's microscope lenses, being as large as they can be made (even so, they are smaller than the average dental filling), and being used at distances smaller than the thickness of a sheet of paper, have very little depth of focus. If there is an almost infinitesimal difference in level between two parts of a rock specimen being examined, only one level will be sharp in the finished picture, unless a compromise is made, in which both levels appear a bit fuzzy.

There is a mathematical law, carefully worked out some years ago, saying that bumps and flaws smaller than one-fourth of the wavelength of the light passed through a lens do not matter. Now Dr. Graton finds that they do matter, and is able, with his one-ton instrument, to get focus accurate to within one-tenth of the wavelength of the light used. Naturally, with this accuracy, an error of about one-fourth the wavelength of the light used will put everything out of order.

With the great accuracy possible in the new instrument, many of the supposedly impossible things in microscopy have already been done, and no new limits are in sight. Today, with the new instrument and the newly-developed grinding equipment, the nature and construction of many minerals are being worked out, not by theory and long formulas, but by looking at them and seeing. Gold particles so small that they couldn't be seen or photographed before are now inspected with ease, and their relation to the other minerals in the ore sample can be easily determined.

Once it is surely known where the particles are, methods can be devised for getting the gold out of the rock, perhaps profitably. Naturally, if the gold costs more to get out than it sells for, even Dr. Graton's microscope isn't going to help very much.

Instruments of this type will be useful in applied science just as they have already opened new fields in pure science. Mining geology is only one of a number of fields where better microscopes are useful. In the metal industry, where the crystalline structure of metals seems to bear a definite relation to their strength, more detailed studies can now be made. Perhaps the maddening problem of fatigue of metals can be solved by these studies.

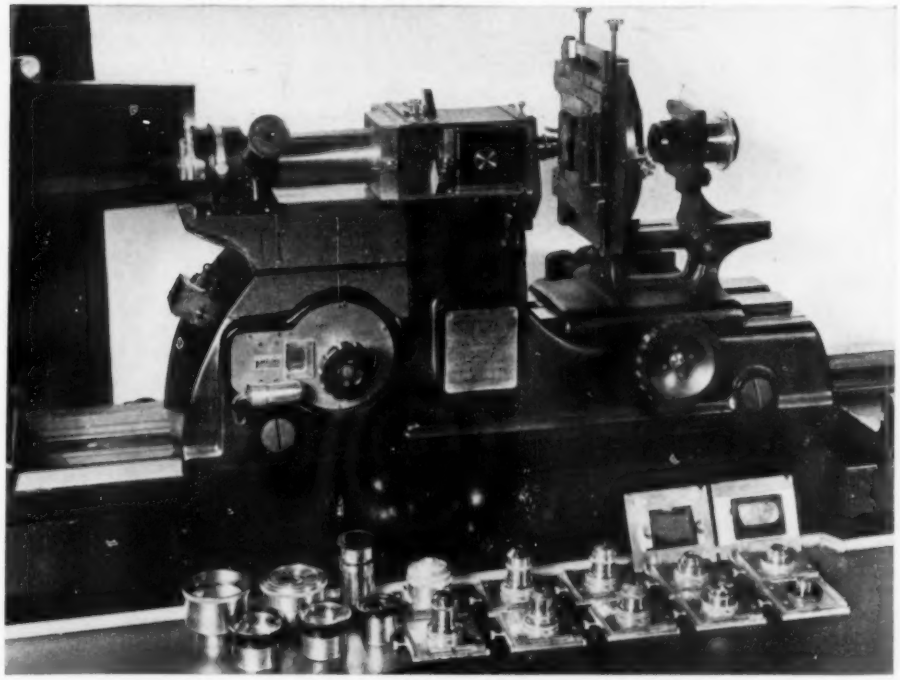
We have all encountered this. Remember the "crystallized" rear axle on your car that broke 40 miles out of nowhere, in the rain? That was fatigue of the metal.

When a metal is strained a number of times, the structure changes, and with it the properties of the metal. When you went over too many bumps, the molecules in that rear axle rearranged themselves, and the axle became brittle, instead of resilient. Microscopic studies of axles that did and didn't break under road usage have already showed what happened. Will better microscopes show how non-fatigable metals may be made?

May Find Virus

Medicine can benefit from the instruments and methods worked out by Dr. Graton and his colleagues. Things that now are indistinct under the best medical microscope can, perhaps, be magnified until the details are distinct. This may lead to finding of the elusive "filterable viruses," which are blamed for so many things that can't be otherwise explained. Are there filterable viruses, or is it merely a scapegoat word, used instead of 'I don't know'?

Although still too crude to see an individual atom, this microscope can probably shed new light on many chemical phenomena. With it, things only 100 times as large as an atom can be examined. In this classification are many crystals, and crystals are very important in modern chemistry. Sugar, salt, caustic soda, sulphur, and a host of other familiar chemicals are crystals. Today we separate many substances by "fractional crystallization," but we are none too sure just how crystals grow. Perhaps, by applying the Graton technique, we can learn more of the early stages of crystal growth, and with this understanding, attack the problem of making crystals grow as we want them. The dividing zone between the growing of mineral crystals in the earth and of sugar crystals in a vat is becoming narrower each year.



INVESTIGATE THE INFINITESIMAL

Part of the new Harvard super-microscope, with which magnifications of 6,000 diameters have already been secured. A few of the lenses used with it rest on the bench in the foreground.

What will the use of greater magnifications mean to the paleontologist, who searches for the skeletons of extinct animals in rock laid down millions of years ago? From studies already made on micro-fossils, billions of barrels of oil have been located, other areas have been shown to be barren of oil, and the locations of the seas and continents of long ago have been mapped. Will this new microscope reveal a whole new series of ancient life forms, so small that present methods have missed them? The possibilities are interesting, although no real search has yet been made for the microbes that preyed on microbes of the past.

Can Study Bacteria

Bacterial classifications, now made on the basis of the shape only, may be simplified and made more accurate when the Graton microscope, and the methods of securing higher magnification learned from it, are applied to bacteriology. With such magnifications, the internal structure of bacteria can be studied, and the small living forms classified on the basis of finer details, instead of mere gross shape.

Dr. Graton's new microscope should not be regarded as a new discovery (although discoveries have already resulted from its use) but as a more exacting tool for science. It may be, as a result of the painstaking care put into its construction, the means of getting more accurate determinations of many things that are now uncertain. Already, it has pointed the way to a new era in microscopic work, where micrometer methods will replace the present rough yardstick-like, rule-of-thumb measurements. Getting things right, instead of getting something that might do, will be easier with it, and studies heretofore impossible can now be made with this and similar instruments.

"Try It"

Makers of microscope lenses, using formulas now proved to be wrong, made lenses that worked better than the formulas called for. With these lenses, Dr. Graton did things regarded as impossible. What will he be able to do with lenses designed according to new formulas, with no limit known to the magnification possible? Dr. Graton himself will not say, but recommends a "try it and see" policy, in which tests of actual lenses, under working conditions, are

substituted for mathematical formulae.

Roughly, Dr. Graton believes in performance tests, instead of sales talk. No matter how good the formula, he states, the lenses and other equipment should be tested to see exactly what they will and will not do. A mining man would say that Dr. Graton placed more faith in assayer's report than in prospectus.

Not long ago, magnifications of more than 1500 diameters were regarded as impossible. Recently, Dr. Graton, with his new instrument, got useful magnifications of 6000 diameters—making images cover sixteen times as much area—and empty magnifications, making things bigger, but showing no additional detail, of as much as 50,000 diameters.

The microscopist today is in somewhat the same situation as the explorer just after America was discovered—he knows of new kingdoms of conquer, but hasn't mapped them yet.

What will he find?

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Science News Letter, October 1, 1938

PHYSICS

Soap Bubbles Aid Explosion Studies

AT THE National Bureau of Standards in Washington Uncle Sam's scientists have been blowing soap bubbles in the laboratory and learning new secrets of how explosions occur in gases. Particularly they have been seeking to learn how fast a flame from an explosion will speed through space, a matter intimately tied up with explosive fires and indirectly with the efficiency of internal combustion engines.

Scientists Ernest F. Fiock and Carl H. Roeder, in a report prepared for the National Advisory Committee for Aeronautics, outline their methods of soap-bubble blowing and why it has value in combustion research.

The trick is to blow a soap bubble with an explosive gas, such as carbon monoxide, and make it form around a gap between two metal wires. Across this gap an electric spark can be made to jump, ignite the gas and create the explosion. Just as the explosion is to occur a high speed motion picture camera, taking over 1,600 frames a second, goes into operation and photographs the progress of the flame.

Key point of the soap bubble method is that it occurs essentially in free, or unconfined, space, because the soap film expands very easily to any pressure increase. As a matter of fact, the method is said to give results under constant pressure and at the same time enables the direct observation of the relative speeds of the flame and the expanding, but yet unburned, gases.

For explosions of carbon monoxide it was found that flame speeds reached values of 900 centimeters per second or about 20 miles an hour.

The soap bubble method has been a pioneering effort in the broad study of gaseous explosions. The general project is being continued, says Mr. Fiock, by additional methods which should have an even wider range of applications.

Science News Letter, October 1, 1938

ENGINEERING

Racing Sailboats Fitted With Streamlined Rod Rigging

Borrowed From Aviation Design, New Rigging Is Aiding Boats To Victory By Reducing Drag

THREE racing sailboats which have compiled impressive race records during the 1938 yachting season owe part of their success to the newest thing in sailboat equipment, streamlined rod rigging — borrowed directly from the streamlined struts of airplanes.

Using rigid streamlined rods that resemble the struts widely used on aircraft before the introduction of internal bracing, the Goose, Venture and Foo, three racing craft in the six-meter, eight-meter and Star classes respectively, have scored again and again on Long Island Sound and elsewhere this summer.

They gain reduced wind resistance from the novel type of rigging, used in place of the more conventional steel cable. More important, they gain rigidity of mast setting, an important fine point in racing design, where a minor improvement will mean the difference between a place and a victory.

Developed by E. Burke Wilford, a Philadelphia aeronautical designer, and the Pennsylvania Aircraft Syndicate, the streamlined rod rigging stems directly from the rigid round rods with which the yacht Ranger, successful defender of the America's Cup a year ago, was equipped by Mr. Wilford.

The novel type of rigging may add perhaps a tenth of a knot (a knot is a rate of one mile and a sixth per hour) to a boat's speed, but that adds up to a quarter to half a mile in a race lasting several hours, no mean addition to any racing vessel's performance.

Use of the rods instead of cables means less stretching of the rigging. This, Mr. Wilford told Science Service, spells a mast more rigidly centered. Improper positioning of the mast can seriously affect the boat's performance. When cable is used, constant "fussing" is required. On the other hand, a single adjustment of the rod rigging may do for a season.

Drag of the streamlined rod rigging ranges between one-eighth and one-third that of the cable, depending upon wind direction and the boat's particular sailing maneuver, according to Mr. Wilford. The rigging was wind-tunnel tested insofar as possible.

Another gain in reducing drag comes from the fact that less rigging is needed. Not all the rigging consists, however, of streamlined rods. In some places round rods are used for convenience; in the case of moving cables, cable must still be used. A flat tape is, however, being studied as possible replacement.

Although the rod rigging required by the Ranger was very expensive, cost of a set of rods and accessories for the smaller sized boats is said to be very little more than the conventional rigging.

Science News Letter, October 1, 1938

GEOLOGY

Valley of Dead Sea Was Pushed Down

THE DEAD SEA and the valley in which it lies, famous in Biblical history, did not merely drop to their present position far below sea level. They were actually pushed down, Dr. Bailey Willis of Stanford University has reported to the Geological Society of America.

The Dead Sea area started its downward movement early in the age of dinosaurs. It continued as a catch-basin for sediments until mammals began to dominate the earth. Then its borders rose into high hills, rimming the region with a mass of complexly folded rock.

Science News Letter, October 1, 1938

FORESTRY

NATURE RAMBLINGS
by Frank Thone

Forestry's Magna Charta

DURING the past ten years a quiet revolution has taken place in this country. It has little or nothing to do with the socio-political field—there has been a revolution there, too, if you like; but nobody could claim it was a quiet one.

Our quiet revolution nevertheless affects the lives of all of us and will continue to do so for a long time to come, for it is in the field of forestry. Ten years ago Congress enacted the McSweeney-McNary bill, which placed forestry research in this country on a solid, systematic basis. During September, foresters celebrated the decennial of their Magna Charta, and a special issue of the *Journal of Forestry* (Sept.) is devoted to a discussion of scientific progress in all branches of forestry during that period.

There is much more to forestry than just going out and planting a lot of new trees where old ones have been cut down. Managing a forest is a more complex job than managing a factory—or even a whole chain of factories, for forest products cover a range all the way from timbers and turpentine to such intangible services as watershed protection and fun for fishermen. And forest research must take all these things into account.

Basic idea of the research program is stressed by Dr. Earle H. Clapp, associate chief of the U. S. Forest Service:

"The Act and the various things that have grown out of it have helped drive home the concept that the forest of any area is a biological entity, all the elements of which are integrated with all the others and are influenced by them.

"The biological elements of the forest of an area or region extend in the same way into the social and economical field. All of this exceedingly complex interrelationship has emphasized the need for conducting research on the basis of these relationships, or in brief, the need for cooperation by groups of specialists in co-ordinated, well-rounded-out many-sided attacks in contrast with isolated and purely individual work."

Science News Letter, October 1, 1938

CHEMISTRY

Radioactive Iron Atoms Give New Way to Diagnose Anemia

Act as Tracers to Show Absorption of Iron in Blood; Non-Anemic Test Animals Show No Such Absorption

BOMBARDED iron atoms, made artificially radioactive until they give off radiations like radium, hold the possibility of serving as a test for anemia, it was reported to the Milwaukee meetings of the American Chemical Society, by scientists from the University of Rochester School of Medicine.

In studies on anemic dogs it was found that these radioactive iron atoms, serving as tracers of absorption of iron in the body, entered the blood plasma and later the red blood cells. Six hours was all that was needed to show first evidences of this absorption and by the end of three days virtually all the absorbed iron was in the protein of the blood cells.

In contrast in the case of non-anemic dogs, there was practically no absorption of the iron into the blood plasma and cells. This is therefore the key to rapid diagnosis. The new test was reported by Drs. William F. Bale and Frances L. Haven, of Rochester, N. Y.

"It would appear," they reported, "that, at least in the dog, iron absorption from the gastro-intestinal tract is governed by the need of the body for iron. It seems certain that this radioactive iron will in the future prove a valuable tool in anemia and blood regeneration studies, since in the past studies of iron assimilation and use have been difficult and the results uncertain because of the difficulty of chemical analysis with the small amounts of iron involved."

Participating in the experiments were Dr. P. Hahn and Prof. G. H. Whipple, of the University of Rochester, and scientists of Prof. E. O. Lawrence's laboratory at the University of California.

New Treatment at Mayo

A more scientific treatment for the dangerous ailment of intestinal obstruction in man was suggested in a report by Mayo Clinic chemists and physicians.

From experiments on animals it has been shown previously that during such obstructions the amount of potassium in the blood serum increases and it has been postulated that death in these animals, not given remedial treatment, was due to potassium poisoning, said Drs. Arnold E. Osterberg, J. A. Bargen and M. A. Falconer, reviewing their past studies and those of other workers.

On patients at the Mayo Clinic having this serious affliction, the scientists tested out this hypothesis to check human against animal behavior. Contrary to findings in animals the human patients showed, not an increase in potassium in their blood serum, but an actual decrease.

These new studies emphasize the differences which sometimes exist between conditions found in animals and the clinical findings in man and show how slow medicine must be in any attempt to translate discoveries on animals into conclusions on human patients.

At the Mayo Clinic now, instead of making every effort to decrease the potassium content of the blood serum in cases of intestinal obstruction, the patients are being given injections of solutions containing small amounts of potassium, calcium and sodium salts as well as sugar for its quick energy content. These injections are given following the removal of the obstruction by surgical or other means.

New Growth Substance

A new growth chemical, known as "biotic acid," has been discovered at Oregon State College by Prof. Roger J. Williams and Robert E. Eakin, who described its properties and action in a technical report to the chemists.

The new substance stimulates the growth of yeast cells and appears to aid another growth chemical, known as

pantothenic acid, in producing a very swift growth.

Pantothenic acid is another discovery of Prof. Willliams which was reported several years ago. Pantothenic acid and perhaps the newer biotic acid also, are believed to be "indispensable cogs" in the machinery of living cells.

From the laboratories of many workers throughout the world a number of yeast growth stimulating substances have been discovered, Prof. Williams said. As yet these are known only as Bios IIA, Bios IIB and so forth, the general designations merely marking different substances without real knowledge of their actual identity.

In this respect the situation is about like that of the vitamins where the letters A, B, C, D, and so on have been used. Gradually the vitamins are being identified as definite chemicals and it appears probable that the Bios factors, too, may some day be given exact chemical identity.

One vitamin recently made synthetically is vitamin B_1, now known as thiamin, which was created by Dr. Robert R. Williams, chemist of the Bell Telephone Laboratories. He is the brother of Dr. Williams of Oregon State.

The new "biotic acid" discovered by Oregon's Dr. Williams is different from all other growth substances and is characterized by very definite acid properties, low molecular weight and easy oxidization by hydrogen peroxide.

Antiseptics More Effective

It should be possible to increase many-fold the germ-killing effectiveness of commercial antiseptics.

The gain in the germ-combating properties can be achieved by changing the acidity of the solution containing the antiseptic and making it more acid, reported Purdue University chemists, W. A. Bittenbender, Prof. E. F. Degering and Prof. P. A. Tetrault.

Potent phenylmercuric nitrate, known in the trade as P.M.N., is about 60 times more effective at an acidity rating, or pH, of 3 than it is at an acidity rating of 7, corresponding to the acidity of water. Acidity rating 3 is about as acid as tomato juice.

Under the same experimental conditions, reported the chemists, much-used hexylresorcinol, better known as S.T. 37, is about 30 times more effective. Similarly merthiolate shows a germ-killing gain of seven times, tincture of iodine a gain of four times and carbolic acid a gain of one and a half times.

"Although it has been known for some time that acidity has an enhancing effect on the bacteriostatic properties of benzoic acid in so far as its use in tomato juice and similar preparations is concerned, it was not realized that some micro-organisms are much less resistant to destruction by certain chemicals with an increase in acidity," the chemists declare.

"As a result, it should be possible to buffer the acidity of our commercial antiseptics so as to make them much more effective than has been possible heretofore."

Heat Increases Weight

When you get on a scale on a hot day you appear to weigh more than you really do, it was explained to the meeting. If you really weigh 150 pounds you will appear to gain a quarter ounce in weight on a hot day as compared with your weight on a cool one.

Rev. Francis W. Power, professor of microanalysis at Fordham University, explained this weight discrepancy in his report on the difficulties of micro-weighing where weights as small as 1/50,000 of a postage stamp can be measured.

When you weigh yourself on a beam balance with sliding brass weights, Prof. Power said, both you and the weights are buoyed up a bit by the air surrounding you both. The buoyant effect of a given volume of warm air is less than the buoyant effect of an equal volume of cold air.

"To say that the body is buoyed up less (in warm air) is the same thing as saying that it apparently weighs more. And there you are," added the chemist.

Prof. Power used his example to emphasize that in micro-weighing it is possible to obtain extreme accuracy only when the work is carried out in a constant temperature room.

Heavy Oxygen As Tracer

Prof. Harold C. Urey, 1934 Noble Prizeman in chemistry, reported the increasing use of heavy oxygen atoms as tags or tracers in a variety of organic chemical reactions never before completely understood by chemists. In his report to the meeting of the American Chemical Society, Dr. Urey with Dr. Irving Roberts pointed out that prior to the recent use of heavy oxygen as a means of tracing reactions, there were only about a half-dozen organic reactions completely understood, out of the hundreds which chemists can produce.

To this small stock of exact knowledge, scientists have now added five compounds whose reactions are understood. Thus in one spurt, in research that has been conducted at Columbia University, the University of Chicago, and Manchester University in England, chemistry has almost doubled its stock of exact knowledge of how various atoms in simple molecules are put together.

But this, gratifying as it is, is only a beginning. When Columbia's 200 cubic centimeters of heavy oxygen has been increased, the scientists will be able to supply other workers with the oxygen tracer atoms, and scores of scientists can

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New Vitamin Test

A new method of testing the presence of vitamin B_1, which removes the human element in the investigation and makes a photoelectric cell do the work was described to the chemists.

The present method of testing vitamins is to feed them to laboratory animals, watch the effect on their growth, and then—by weighing the animals over periods of time—determining the benefits of the vitamin's presence in the diet. This bio-assay, as it is called, is a slow and tedious process, and even when complete is always subject to scrutiny because of possible errors.

Drs. Douglas J. Hennessy and Leopold R. Cerecedo of Fordham University described how, in the case of vitamin B_1 at least, the power of the "electric eye" can take much of the human element out of such assays.

Previously the Netherlands scientist Jansen had discovered that when vitamin B_1—known chemically as thiamin—is oxidized it turns blue if irradiated with ultraviolet light. The intensity of the blue fluorescence, the Fordham investigators found, is a measure of the amount of vitamin present. With a photoelectric cell they were able to determine, without human error of judgment, the intensity of the blue color and hence the concentration of the vitamin.

Science News Letter, October 1, 1938

PSYCHOLOGY

Similarities May Provide Clue To Mental Treatment

THE MANY ways in which John Smith is like Hank Jones may provide scientists with a new clue for understanding why some are successful in life and why some wind up in the mental hospital.

Bringing mathematics to the aid of psychology, Dr. Joseph Zubin of the Mental Hospital Survey Committee, told the American Psychological Association that a statistical study of like-minded people and how they resemble each other may lead to a straightening out of the present confusion between similar types of mental disease. This is of vital importance to physicians because two patients apparently suffering from the same mental symptoms may not respond to the same treatment. Although outwardly similar they really differ from each other in ways now unknown to science.

Science News Letter, October 1, 1938

RADIO

Proposes Limit to Distance For Radio Remote Control

Devices for Distance Tuning of Radio Sets Are Really Small Transmitters Sending Out Waves and Interference

THE FEDERAL Communications Commission is tackling the knotty problem of fixing distance limits over which the new radio remote control devices can operate.

You can now buy tiny radio transmitters which will play phonograph records in your home and broadcast their program to your own large radio set. You can also push a button and tune your set by radio waves while sitting across the room. And there are systems for analyzing radio listener response in which the individual listeners push a button and record by radio—a block or two away—whether they are listening to specific programs.

All these devices require small radio oscillators and transmitters which send out radio waves and hence they might under existing radio rules, require a licensed radio operator to make them work. The task of licensing the laymen users of these devices is, of course, an impossibility and so if they are to continue to serve a useful purpose some solution must be achieved.

While the simple operation of many of these devices makes a requirement for a licensed radio operator seem ridiculous, the fact remains that, in the last few years, there have been an increasing number of charges of interference with already licensed reception. The FCC's task is to fix, somehow, the limits—in distance—over which such devices shall act.

Generally Accepted

At informal hearings in Washington the manufacturers of these devices have shown fairly general acceptance of the Commission's proposal that interference shall be construed not to exist if the tiny amount of field energy of 15 microvolts per meter is not exceeded at a distance of lambda over two pi, where lambda is the wavelength of radio wave emitted and pi has its usual numerical equivalent of 3.14.

In actual practice lambda over two pi comes out to be a distance of 157 feet for a radio wave having a frequency of 1,000 kilocycles; 78.5 feet for 2,000 kilocycles and in the ultra-high frequency bands a distance of only five feet at a frequency of 30,000 kilocycles.

At the hearing the only adverse opinion on this regulation came from those concerns making remote control devices operating on the high frequencies. Most of them wish to control mechanisms some 20 feet away and a restriction limiting action to distances of 5 feet would bring sizable problems.

Science News Letter, October 1, 1938

FISHERIES

Compressed Air Harpoon Helps Keep Whale Afloat

A COMPRESSED air harpoon has been invented by Karl Moos, a Norwegian machinist. Instead of the gunpowder charge commonly used in present-day harpoon guns, Mr. Moos' invention is propelled by air under a pressure of more than 5,000 pounds per square inch.

Not only that, but when it is fired, the hollow harpoon is filled with air under the same pressure. As it strikes the whale a valve is opened and the air is released into the whale's body. This hastens the death of the animal and also keeps it afloat until it can be taken up by the whaling ship for cutting up.

Science News Letter, October 1, 1938

A government scientist has invented a device to measure the length and crimp of wool fibers quickly.

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Photography

THE AMERICAN ANNUAL OF PHOTOGRAPHY, 1939, Vol. 53.—Frank R. Fraprie, ed.—*Amer. Photographic Pub. Co.*, 330 p., illus., paper $1.50, cloth, $2.25. This well-known annual contains an unusual amount of text material in addition to an excellent collection of photographs. A list of Who's Who in Pictorial Photography, a numerical evaluation of pictorial achievement of photographers, and a list of photographic societies add to the volume's interest.

Science News Letter, October 1, 1938

Archaeology

THEY WROTE ON CLAY: The Babylonian Tablets Speak Today—Edward Chiera; George G. Cameron, ed.—*Univ. of Chicago*, 235 p., illus., $3. See page 215.

Science News Letter, October 1, 1938

Aeronautics

WINGS IN THE NIGHT—Willis S. Fitch—*Marshall Jones*, 302 p., illus., $2. An authentic story of today's deadly knights of the air (if they can be called such)—the bomber pilots. Tons of paper have been used to tell the story of the pursuit flyer, but this is one of the first accounts of his more deadly confrère.

Science News Letter, October 1, 1938

Mathematics

NEW HIGHER ARITHMETIC—John C. Stone and Virgil S. Mallory—*Sanborn*, 458 p., $1.32. A senior high school text in arithmetic which places the emphasis on the social uses of its field. There are chapters on saving and investing money, budget problems, proper use of graphs, and many other points.

Science News Letter, October 1, 1938

Chemistry

AN INTRODUCTION TO CHEMISTRY—John C. Hogg—*Oxford Univ.*, 365 p., $2. A chemistry text used at Phillips Exeter Academy and designed for preparatory school use.

Science News Letter, October 1, 1938

Astronomy

A HUNDRED YEARS OF ASTRONOMY—R. L. Waterfield—*Macmillan*, 526 p., $5.75. From the discovery of Neptune to the discovery of Pluto (plus a few years on either side) stretches a span of time that marks as great a revolution in astronomy as it does in the other sciences. Whether we live in an exploding universe or not, our knowledge of it has certainly expanded at an explosive rate. By limiting his segment of history to a century, this English astronomer has all the more dramatically emphasized the quality and tempo of events.

Science News Letter, October 1, 1938

Hygiene

CARE OF INFANTS AND CHILDREN—Harry Lowenburg—*Whittlesey*, 300 p., $2.50. Simply written, straightforward advice and directions for mothers and nurses.

Science News Letter, October 1, 1938

Zoology

THE MAMMALS OF CHINA AND MONGOLIA: Part I—Glover M. Allen—*Amer. Museum of Natural History*, 620 p., 22 distribution maps, illus. and plates, $10. It is most fortunate that the mass of data treated in this truly monumental monograph was collected before civil war and invasion so disrupted China that further field work became all but impossible. Now, when peace returns to the Far East, zoologists desiring to work on the fauna of that region will have a solid foundation to begin on. This volume (the completing second volume is to appear presently) contains the text descriptions of most of the mammalian species, with nine plates and 40 pages of bibliography.

Science News Letter, October 1, 1938

Natural History

PORTFOLIO ON THE NATIONAL PARK AND MONUMENT SYSTEM—*American Planning and Civic Association*, 4 booklets, illus., 75 c. Part I, What Are National Parks; Part II, Conservation of Nature; Part III, Preservation of History; Part IV, Facilities and Service. With many striking pictures and few but well-chosen words, these booklets bring home a knowledge of what national parks are, their quality and character, their most enjoyable uses, and the public's responsibility for their preservation.

Science News Letter, October 1, 1938

Physics

ELEMENTARY SURVEY OF PHYSICS—Arthur E. Haas and Ira M. Freeman—*Dutton*, 203 p., $1.90. Here is a non-mathematical presentation of the field of physics in concise form. The emphasis is on the cultural discussion of scientific research. A special supplement is also provided which is intended for use by pre-medical students. In it the applications of physics to medicine are described.

Science News Letter, October 1, 1938

Ichthyology

STRANGE FISH AND THEIR STORIES—A. Hyatt Verrill—*Page*, 220 p., illus., $2.50. Stories of fish that fly, fish that walk on land, fish that shoot their prey, and many other tales of fish incredible but true are here put together to make a most entertaining book.

Science News Letter, October 1, 1938

Botany

BIG TREES (Rev. ed.)—Walter Fry and John R. White—*Stanford Univ. Press*, 126 p., $1.50. The botany of the Big Trees, their modern history, and one might almost say their geology (they are so old) are all well told in this compact book, now in a well-merited new edition.

Science News Letter, October 1, 1938

Chemistry

CHEMISTRY OF THE PROTEINS (2d. ed.)—Dorothy J. Lloyd and Agnes Shore—*Blakiston's*, 532 p., $5.50. A comprehensive English text summarizing the literature of protein chemistry through 1937. At the end of each chapter are extensive listings from scientific literature which will be of great aid to specialists in this field.

Science News Letter, October 1, 1938

Physics

LABORATORY EXPERIMENTS IN ELEMENTARY PHYSICS—Newton Henry Black—*Macmillan*, 263 p., $1.24. The textbook, Black and Davis' Elementary Practical Physics, is so widely known and so widely used in America that one needs only to say of this newer book that it is a collection of experiments designed to accompany the former text.

Science News Letter, October 1, 1938

Mathematics

REVIEW COURSE IN ALGEBRA—W. E. Sewell—*Heath*, 145 p., $1.20.

Science News Letter, October 1, 1938

Education—Physiology

MEASURING ACHIEVEMENT IN PHYSICAL EDUCATION—Ruth B. Glassow and Marion R. Broer—*Saunders*, 344 p., $2.75. Teachers of physical education will find this a helpful book. The authors not only give tests and methods for measuring achievements in physical education, but discuss the value of tests and measurements in general and indicate what may be expected of them and to what extent they may be relied upon.

Science News Letter, October 1, 1938